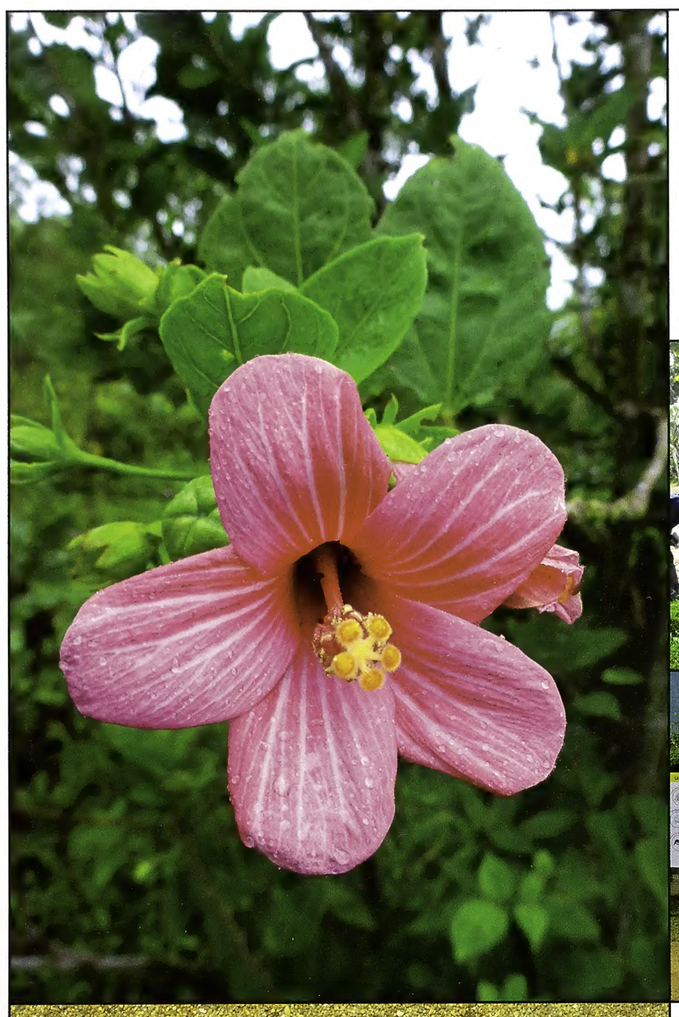
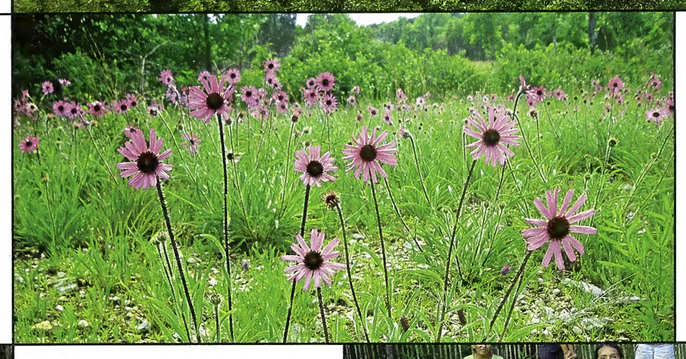
Missouri Botanical Garden

Conservation at the Missouri Botanical Garden



Mauritius, a small island in the southwest Indian Ocean, is home to more than 500 native species of plants, 315 of which are endemic and found nowhere else. Before its discovery by the Portuguese in 1507 there were no terrestrial mammals, which allowed a good number of flightless birds and large reptiles to flourish. The island was quickly cleared, mostly to grow sugar, and today less than 2% of the original forest remains. More than 200 of its plant species are threatened and 50 species are known from fewer than 10 individuals in the wild. MBG is making the rescue, propagation, reintroduction, and conservation of these rare Mauritian plant species a priority in a country where such a large number of species are in dire need of efforts to ensure that they survive. *Hibiscus boryanus* is a critically endangered species known from only three locations in Mauritius and Reunion. It is an example of the more than 200 plant species that are threatened in the Mascarenes, many known from few enough individual plants to be countable. MBG scientists are assisting with the rescue and propagation of these endangered plants and working to ensure their future survival.

The Garden is working to conserve a network of 13 priority conservation sites in Madagascar to inventory local plant diversity, identify those species that are threatened, and reforest degraded areas to provide habitat for protection of the rare species. Pictured is Parc Ivoloina, where MBG is partnering with the Saint Louis Zoo and Madagascar Flora and Fauna group to restore lowland eastern evergreen forest that is important habitat for lemurs.



The recovery of *Echinacea tennesseensis* (Asteraceae), the Tennessee coneflower, from the brink of extinction exemplifies conservation success. In 1979 it became only the second plant to be listed as endangered by the U.S. Fish and Wildlife Service. New populations were established on protected lands using seed collected from five remaining natural populations. Reintroduced populations are healthy and functionally similar to naturally occurring populations. The species was officially delisted in 2011.

Repatriation of local and indigenous knowledge is a major focus of the WLBC** through inventories of traditional knowledge made in collaboration with researchers from local institutions in Peru, Bolivia, and Madagascar. Results are shared with local communities and published in local languages, and previous studies have been translated and repatriated so that authorship of traditional knowledge remains with the communities.

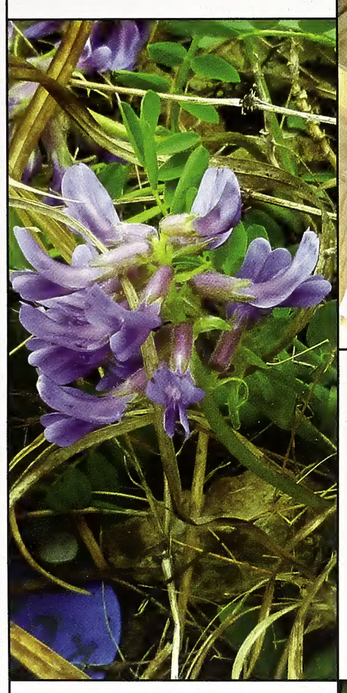
Prestonia leco (Apocynaceae) is named for the Leco people living in Bolivia's Madidi region. One of every 300 plants collected there is a species new to science. Most of these species are found only in Bolivia, in some cases only in a single site, making them vulnerable to extinction. The Garden's work in discovery, documentation, and species inventories, particularly in protected areas, has contributed significantly to conservation of threatened plants *in situ*.

In the Selva Central of Peru, the CCSD* conducts environmental education programs that combine classroom and hands-on learning. The programs nurture respect for the environment and teach ways to use local resources sustainably. With their teachers and parents, students develop vegetable gardens as sustainable food sources. Crops from these gardens help improve the variety of foods in the diet of villagers while strengthening knowledge of forgotten ecological agricultural practices.

The Garden is conducting a global assessment of the nearly 800 species of ebony trees (*Diospyros* spp.), valued as timber for their dark, hard, clear-grained wood. Many of the species are threatened by overharvest, and their conservation status will be determined by the project. A review of all species is being conducted, and more than 100 species new to science have been discovered in Madagascar, including half of those with fruits pictured here.

In Santa Cruz, Bolivia, the CCSD* collaborates with schools to integrate environmental learning inside and outside the classroom. The school garden program emphasizes hands-on learning, including preparation of organic compost, and teaches students that they can grow vegetables organically in a small space. Learning about organic gardening is especially important in Bolivia, where most of the vegetables available are chemically treated. Students are also given seeds to start their own home gardens.

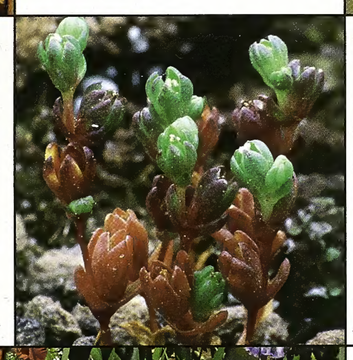
The CCSD* is working with the indigenous Yanesha group living in the Palcazu River watershed of Amazonian Peru to conserve medicinal plant diversity. CCSD engages Yanesha high school students with older community members to gather, record, and ultimately restore traditional knowledge of medicinal plants. Here, a student uses a digital camera to document medicinal plant species for development of a database that will support *in situ* and *ex situ* conservation.



The Garden has developed and opened a new seed bank. This long-term *ex situ* seed storage facility provides a safety net for plant species or populations that may become extinct or threatened in the wild. By storing frozen seed we can preserve genetic diversity within a relatively small space, and if species are imperiled as a result of habitat loss or climate change, these stored genetic resources will be available for restoration and conservation purposes.

Dracaena umbraculifera was described in Nicolas Jacquin in 1796 from material cultivated in Vienna, but attributed to being native in Mauritius. However, the plant has never been located and is presumed to be extinct in the wild. This magnificent species remains alive because of a handful of individual plants in botanical gardens, including a magnificent specimen in the Climatron® of the Missouri Botanical Garden.

Education and raising conservation awareness are key components of the Garden's community-based conservation programs at 13 sites in Madagascar. A child browses books in a conservation center built by the Garden in the eastern coastal town of Mahabo. The local MBG program here works to jointly improve living standards and train teachers in environmental education as well as inventory and conservation of local plant diversity.



Mononeuria minima (Caryophyllaceae) is a federally threatened species whose common name, Tiny Tim, reflects its diminutive stature (1-4 cm). While most populations occur on exposed sandstone outcrops in southern Missouri, the species also occurs in Arkansas, Louisiana, and Texas. Recent genetic analysis found that a small number of populations harbor the majority of genetic diversity for the species, making the protection of these populations essential for its conservation.

The Elizabeth E. Bascom Fellowship in Conservation Biology provides opportunities for students and researchers from the developing world to broaden their experience in plant conservation. Bascom fellows join CCSD* researchers in projects such as seed banking, population monitoring, reintroduction, and germination ecology. Here, Fellow Marcia Ricci, from Chile's Corporación Nacional Forestal, aids in the monitoring of reintroduced populations of *Astragalus bibullatus* in the Central Basin of Tennessee.

Astragalus bibullatus (Fabaceae), or Pyne's ground-plum, is a federally endangered species endemic to limestone glades in the Central Basin of Tennessee, where it is known from fewer than six populations. Seed has been collected and stored by the Garden for more than 20 years, enabling the reintroduction of new populations to protected lands within its natural range. Population monitoring has established targets for restoration of suitable habitat for recovery of this species.

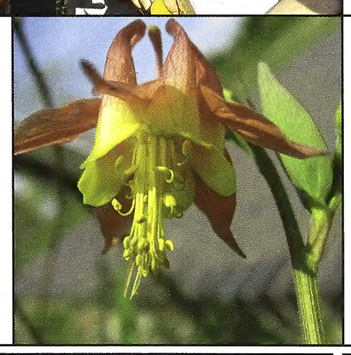
In St. Louis the Garden maintains living collections of 16,381 taxa, of which 221 are rare or threatened. The Living Collections Management System database tracks every stage of a plant's life at the Garden from collection through cultivation. In addition to safeguarding species in the living collection, the recording of propagation and cultivation information allows for targeted development of living collections in support of *ex situ* conservation, particularly in developing species management and recovery plans.

Trillium pusillum var. *ozarkanum* (Melanthiaceae), the Ozark wake robin, is a globally vulnerable species restricted primarily to the Ozark and Ouachita Mountains of Missouri, Arkansas, and Oklahoma, where it occurs in dry oak-hickory and oak-pine forests. First described by Garden botanist and *Flora of Missouri* author Julian Steyermark, it is a unique variety of a species known principally from the Atlantic Coastal Plain. In Missouri, most populations are concentrated in a small area.

Photosynthetic rate and water-use efficiency of a plant are measured in an experiment designed to understand the genetic architecture of drought stress. The CCSD's* conservation genetics program applies genetics to address critical conservation needs. In the program's dedicated lab, CCSD scientists use state-of-the art tools and methods to gain knowledge essential for the management and long-term preservation of plants, particularly species of conservation concern.

The tree fern *Cyathea caracasana*, which grows across a range of successional habitats, is pictured here on the eastern slopes of the Bolivian Andes. For over a decade, the Garden's Madidi project has been studying this region, documenting its enormous plant diversity, and trying to understand the ways in which natural plant communities are responding to anthropogenic forces, such as ongoing global climate change.

The Garden conducts extensive environmental awareness activities in all regions and countries in which it has active programs, helping to increase basic ecological literacy, encourage sustainable living, and stimulate conservation action. As part of this effort, the Garden launched its Center for Nature-Inspired Learning, which focuses on specific interventional strategies during the formative early childhood years, the critically important teen years, and the influential role of teachers.



The Garden's Sacred Seeds initiative promotes and undertakes conservation and sustainable use of traditional food and medicinal species in over 30 garden networks on five continents. The initiative has developed gardens of threatened useful plants, many managed by indigenous counterparts. The Ponca, Pawnee, Omaha, and Meskwaki used crushed or chewed seeds of one of these species, red columbine, as a perfume, and many people believe the plant was also a love charm.

Prescribed burning is an essential tool for conservation and restoration of natural areas such as the Garden's Shaw Nature Reserve, where fire has been used extensively to help restore habitats and help reestablish and maintain native biodiversity. The prairie, savanna, glade, and woodland ecosystems of North America have been shaped by thousands of years of both natural and anthropogenic fire.

Many plants, including some of the rarest species in North America, are dependent upon the ecological conditions promoted by fire for their persistence. In the absence of fire, fire intolerant species such as *Juniperus virginiana* (eastern redcedar) rapidly dominate these fire-dependent ecosystems. Garden researchers examine the role of prescribed fire in maintaining the diversity of plant communities and restoring habitats for rare plants.

*CCSD=Center for Conservation and Sustainable Development
**WLBC=William L. Brown Center

Photos by: Matthew Albrecht, Ginger Allington, Timothy Aston, Dan Brown, Rainer Bussmann, Alfredo Fuentes, Casey Galvin, Irene Gauto, Ashley Glenn, Meg Hoester, Marleni Huaman, Mr. Imran, Quinn Long, Ludovic Reza, George Schatz, Rebecca Sucher, Sebastián Tello, Bladimir N. Terán, and Rodolfo Vásquez.

Science and Conservation at the Missouri Botanical Garden

Conservation of plant diversity is central to the mission of the Missouri Botanical Garden. In addressing the major challenges faced in conserving the plants of the world and their ecosystems, the Garden builds upon decades of plant exploration and research. The Garden conducts its work in conservation within the framework of the Global Strategy for Conservation (GSPC), an initiative adopted in 2002 and updated in 2010 by the United Nations' Convention on Biological Diversity (CBD) to halt the loss of plant diversity worldwide. The GSPC, which has 16 targets aimed at achieving measurable plant conservation outcomes by 2020, is the world's most widely adopted instrument for plant conservation. The Garden is strongly committed to this international movement and links its work to each of the 16 targets of the GSPC. We give particular emphasis to documenting and understanding plant diversity by discovering and classifying plants and studying their distributions and relationships over space and time. Our work in conservation includes species conservation and recovery programs (both in the United States and globally), assessments of the risk status of species, and habitat restoration. Through innovative research Garden scientists are developing methods to conserve plant diversity at scales ranging from genes to plant populations to entire ecosystems. We also work to advance plant conservation by collaborating in community-based initiatives that integrate conservation of endangered species and ecosystem management/recovery with community development, poverty alleviation, and the creation of greater socioeconomic incentives for conserving plant diversity.

Visit our website:
www.mobot.org

Dracaena umbraculifera

The Austrian botanist Nikolaus Jacquin described *Dracaena umbraculifera* in 1797 based on a plant cultivated in the botanical garden in Vienna, but attributed it to being originally from Mauritius, one of the Mascarene Islands in the southwestern Indian Ocean. The plant has never been found in Mauritius and is now assumed to be extinct in the wild. This unusual species is now known from only a few plants in botanical garden collections, including a large, magnificent specimen in the Climatron of the Missouri Botanical Garden.

©2014 Missouri Botanical Garden. Illustration from *Plantarum rariorum horti caesarei Schoenbrunnensis descriptiones et icones/Opera et sumptibus Nicolai Josephi Jacquin.* By Jacquin, Nikolaus Joseph, Freiherr von, 1727–1817. Viennae: Apud C. F. Wappler; Londini: Apud B. et J. White; Lugduni Batavorum: Apud S. et J. Luchtmans, 1797–1804. The Missouri Botanical Garden maintains one of the world's finest botanical libraries, including over 6,500 rare books, the earliest datied 1474. Select illustrations are available as fine art prints for purchase at the Missouri Botanical Garden Press website, www.mbgpress.org. View the entire collection of digitized rare books online at www.botanicus.org.

MISSOURI BOTANICAL GARDEN